Parametric Adjectives in the Context of Sentiment Analysis

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Abstract. This paper presents preliminary corpus-based research of special words of the Russian language - parametric adjectives. Parametric adjectives are adjectives whose semantics are associated with the denotation of physical parameters such as size, length, width. Characteristics of parametric adjectives seem to be poorly investigated from the perspective of Sentiment analysis. Therefore, our research is the first step in this direction. We identify and classify the most common contexts for adjectives belonging to four semantic classes such as size, height, weight, and strength.

Keywords: parametric adjectives, sentiment-related words, sentiment analysis, the Russian language, Yandex.Market, customers' product reviews.

1 Introduction

In recent years, the Internet is rapidly developing, including its Russian-speaking segment. In our daily life we face a variety of opinions every day: we read reviews before we buy anything, click “like” button, write comments, read news. We are surrounded by the world of opinions, the world of rating. Society in the modern world is highly exposed to the evaluation activity both in culture and discourse. This phenomenon has become so widespread and has made essential the need for its careful exploration, using the analysis of the sentiment-related words of the Russian language. Different sciences are engaged in research on sentiment analysis: from philosophy and axiology to psychology, political science and linguistics. Linguistics studies the means for opinion and sentiment expression in text and speech at all levels of the language system: phonetics, morphology, lexicology, and syntax.

Opinions and sentiment can be expressed most clearly and fully on the lexicology level. Sentiment-related words can explicitly express positive or negative sentiment in a text or speech.

Sentiment analysis is one example of the practical use of sentiment-related words [6]. Sentiment analysis is one of the areas of computational linguistics, which deals with the task of identifying positive and negative opinions, feelings and emotions of people in relation to various objects. Sentiment analysis allows to know not what people say about an object, but how emotionally they talk about it [8].

One of the most numerous classes of sentiment-related words is adjectives. Among evaluative adjectives, parametric adjectives occupy a special place. Parametric adjectives are adjectives whose semantics are associated with the denotation of physical parameters such as size, length, width. Parametric adjectives in Russian are qualitative adjectives with a nominative size value.

This class of words deserves a separate study, since they form a lexico-semantic class of words, which has distinctive features:

1. They form antonymic pairs, expressing opposite values on the same mental scale. For example, bolshoy (big) - malenkiy (small), vysokiy (high) - nizkiy (low), uzkiy (narrow) - shirokiy (wide).
2. Parametric adjectives can reverse their polarity depending on the context.

As for the first point, the semantics of parametric adjectives are based on the idea of the parameter of objects as a quantity whose values serve to distinguish between objects of a certain subclass.

Words marking the extreme elements of the mental scale can be defined as follows: for example, large – "one that is larger than normal", low – "one that is lower than normal" [11].

Very often, the use of one or another parametric adjective is subjective, since there is no measurement standard. A person, depending on the situation, can choose his own standard. Thus, different persons can use words with the opposite meanings, describing the same objects in the same situations. For one person, the volume level may seem high, and for another person it may be low.

The second feature is related to the fact that parametric adjectives are able to change their polarity to the opposite, depending on which aspect they relate to. For example, the adjective "small" has a positive polarity in combination with the "price" aspect and a negative polarity in combination with the "memory capacity". In this case, subjectivity cannot be avoided too. For example, two people can consider an object small (for example, a tea-pot), but for one it will be a positive moment, and for another it will be negative.

In our study, we will focus on the study of the reverse polarity. The relevance of the study is determined, on the one hand, by its belonging to the field of cognitive linguistics. And on the other hand, by the applied aspect, namely the possibility of using the results of research in Sentiment analysis systems in order to improve the quality of analysis. The purpose of the article is to analyze and systematically represent the most frequent contexts of parametric adjectives, indicating their most probable polarity in these contexts on the material of product reviews. All of the above makes the task of the parametric adjectives contexts study very relevant now.

2 The studies of parametric vocabulary

There are many studies of parametric vocabulary, and basically most of them have been conducted in terms of comparative linguistics, cognitive linguistics, linguoculturology or psycholinguistic.

Mikheeva S.L. in her study [7] considers parametric adjectives as the linguistic embodiment of the measurement system used by people. She claims that the semantic basis of these adjectives is connected with the acceptance of a person as a standard of measurements. For example, for a pair big-small the standard is the body itself, for a pair high-low – the height of a person, for a pair heavy-light – one that is difficult/easy for person to lift. Therefore, parametric adjectives are anthropocentric in nature.

In the work [4] it is shown that the secondary semantic of the parametric adjectives is the expression of the good/bad opposition. For example, adjectives denoting large sizes express a positive assessment, adjectives denoting small sizes express a negative. This is due to the primary value of axiological potencies. The complexity of the analysis of assessment values is due not only to a higher level of abstraction, but also to the fact that the assessment modality is determined by the statement as a whole, and not by its individual elements.

The article [10] is devoted to the study of the characteristics of the use of parametric adjectives in the English, Bashkir and Russian languages in a comparative aspect. The main aim of this research is to characterize the features of interpersonal communication, to identify moral, ethical, axiological and other attitudes of native speakers of Bashkir, Russian and English in the framework of their practical life not only in society, but also in the family.

The paper [9] focuses on the cognitive aspect of the parametric vocabulary that reflect how a person measures, evaluates, classifies certain phenomena, events and objects of the real world. This research is devoted to the study of the process of parametric adjectives acquisition by a child. The article shows semantic and structural characteristics of parametric adjectives of the Russian language on the example of adjectives ‘large’, ‘high’, ‘long’, ‘short’, ‘small’, ‘low, thick’, ‘thin’, ‘narrow’, ‘wide’, as well as synonymous series formed by these adjectives.

M.S. Achaeva in her work [1] studies parametric adjectives ‘wide’ and ‘narrow’ in Russian and English. In both languages, this pair of words is a representative of the category of space and has a complex semantic structure in terms of lexical compatibility, as well as a high metaphor for its meanings.

The article [5] raises another question related to parametric adjectives – the question of a parametric norm. The main element of the content of the parametric norm is the idea of the average degree of the parameter evaluated from the point of view of norm. The parametric norm is the middle part of the scale of the development of a process or manifestation of a sign, and its mismatch is associated with two extreme points: ‘not enough’ and ‘too much’. For example, non-compliance with a parametric quantitative norm arises due to its lack (small) or excess (many).

We were able to find only a small number of works studying parametric vocabulary from the perspective of applied linguistics.

The study [12] attempts a preliminary systematized description of parametric vocabulary, focused on the parametric information extraction in the future. This paper is devoted to Russian parametric adverbs. The author suggests that the features of parametric adverbs seem to be much less investigated (in particular, in the perspective of information extraction) than those of parametric nouns, adjectives, and verbs. The

article identifies eight main groups of adverbs, that are able to express the quantitative meaning. Also, some connections with more studied classes of parametric vocabulary (adjectives, nouns) are shown in this article.

In the paper [3] the main features of parametric vocabulary in the analysis of banking services opinions are studied. For this research the authors have used the material of customer reviews on the quality of banking services. On the material of these reviews, contexts for words ‘large’, ‘small’, ‘long’, ‘fast’, ‘maximum’, ‘minimum’, (and some others) were extracted.

The research results show that parametric words can expresses the opinion implicitly. Some of the parametric vocabulary may be assigned to one of the main classes: positive or negative. Such classification is specific to the given subject sphere. And some of the parametric vocabulary refers to the auxiliary classes (increments, decrements, modifiers).

Increments are words that enhance the polarity of other words in a sentence (for instance, ‘very’). Polarity modifiers are words that reverse the polarity of other words in a sentence (for instance, ‘not’). Decrements are words that cancel the change in polarity, despite the presence of polarity modifiers in the sentence (for example, the word ‘so’ in the sentence “I’ve never been so deceived”).

Parametric adjectives sense disambiguation task is similar to the well-known word polarity disambiguation task which aims to resolve polarity of the sentiment ambiguous words in a specific context.

One of the first appearances of the disambiguating word polarity task was in competition SemEval-2010 [13]. The participants were asked to predict polarity of 14 frequently used sentiment ambiguous Chinese adjectives. There were 8 teams and 16 systems. The best results were shown by the following systems: the system [16] using heuristic rules and the relationship between sentiment ambiguous adjectives and the keywords; the system [15] is based on collocation of opinion words and their targets, context words and neighboring sentences.

This problem is still under an active investigation. Xia, Y., Cambria, E., Hussain, A., & Zhao, H. [14] explored methods based on the Bayesian model. They propose to resolve the polarity ambiguity problem with opinion-level features: opinion target, modifying word and indicative words, as well correlative words in sentence, discourse and application-level features.

As can be seen from the above, while investigations of adjectives polarity disambiguation were conducted in the past, very few systematic and fine-grained studies of the parametric adjectives contexts are available at the moment, especially for Russian language.

3 Text collection

For the study in this paper, we use the set of reviews for products placed on the Internet resource Yandex.Market. For automatic reviews extraction the program in python was developed that uses the API Yandex.Market.

In this way, we've constructed a corpus of 41913 reviews (4 739 010 usage) on 32 categories of products.

For representativeness, we have chosen a variety of product groups that are not like each other. So, we have selected several groups of products from the categories: household appliances, electronics, health and beauty goods, goods for children, pet goods, goods for hobbies and leisure. The distribution of the number of reviews by categories is presented in Table 1.

Table 1. Distribution of the number of reviews by categories

Category	Number of reviews	Category	Number of reviews
Vacuum cleaning robots	2089	Universal external batteries	2010
Smart watches and brace-	2060	Bicycles for adults and children	1720
Electric kettles	2050	Nippers, curling irons and	1510
Cat food	2045	Child car seats	1440
TV sets	2020	Gaming consoles	1390
Cameras	2020	Double boiler	1050
Mobile phones	2020	Mascara	590
Electronic books	2020	Flea and tick remedies for cats	440
Refrigerators	2020	Exercise bikes	400
Headphones & Bluetooth	2010	Quadcopters	400
Washing machines	2010	Proteins for Athletes	339
Coffee makers	2010	Baby drinkers	140
Baby strollers	2010	Baby drinkers	140
Laptops	2010	Electric toothbrushes	80
Shampoos for hair	2010		
Total			**41913**

We have chosen to investigate the most frequent parametric adjectives and have extracted for them all the contexts in which they appeared in the corpus: previous and next word.

Table 2. The most frequent parametric adjectives

Word	Frequency
большой (big)	12847
маленький (little)	4646
лёгкий (light)	3803
высокий (tall)	2788
небольшой (small)	2697
тяжёлый (heavy)	1500
низкий (low)	1466
слабый (weak)	1301
сильный (strong)	1001

4 Positive and negative contexts for different classes of parametric adjectives

4.1 The category "size": 'большой'(large) – 'небольшой'/ 'маленький' (little/small)

'Большой'(large)

1. The first context for the word 'большой'(large) is significant in physical size. This adjective often expresses a positive assessment in combination with the component parts of the object. For example, '*большой экран'* (large screen) *'+'*. But it also can be used in a negative context. For example, '*большие габариты велотренажера' (*the huge size of an exercise bike) *'-'*. There is a connotation "takes a lot of space".
2. The second context of the use of the adjective 'большой'(large) is the expression of the characteristics of the physical volume. For example, '*большой объём резервуара'* (large volume of the tank) *'+'*. In this context, this word usually has only positive polarity.
3. The adjective 'большой'(large) is often found in a combination with the words expressing that one can choose from something or assortment/variety. For example, '*большой выбор цветов'* (a large selection of colors) *'+'*, '*большой набор функций'* (a large set of functions) *'+'*. In this context, this word also has only positive polarity.
4. The fourth context is the use of an adjective with nouns characterizing advantages and disadvantages. In this context the adjective 'большой'(large) has an amplifying meaning and can have both positive and negative polarities. For example, '*большой плюс' (*the great advantage) *'+'*, '*самый большой минус'* (the biggest disadvantage) *'-'*.
5. The last context includes all other uses, most often expressing technical and time characteristics. The common meaning of the word 'большой'(large) in this case is significant in strength, intensity or duration. For instance, one can find phrases '*большое время работы от аккумулятора'* (long battery life) *'+'*, '*большая мощность'* (high power) *'+'*, '*большой объем памяти' (*large amount of memory) *'+'*, '*большой шум' (*a lot of noise) *'-'*, '*большой люфт'* (a big backlash) *'-'*.

'Небольшой'/ 'маленький' (little/small)

For words 'небольшой'/ 'маленький' (little/small), the opposite tendency is observed: in almost all cases when large will have a positive polarity, 'небольшой' and 'маленький' (little and small) will have a negative one. For example, 'маленькая цена' (small price) has a positive polarity.

Both the positive contexts and the negative contexts for adjectives 'большой' (large) – 'небольшой'/ 'маленький' (little/small), are available, see Table 3.

Table 3. Positive and the negative contexts for adjectives bolshoy (large) - bolshoy/malenkiy (little/small)

Type of context	Context	Example
	большой (large)	
Positive contexts	The size of the component parts of the object	*экран (screen), горлышко(neck), колеса(wheels)*
	Volume	*объем загрузки(loading volume), вместительность(capacity)*
	Time and technical characteristics	*время работы от аккумулятора (operating time from batteries), время работы в автономном режиме (work offline)* *громкость звука (sound volume)*
	Assortment/variety	*выбор цветов (choice of colors), функционал(functional)*
	Pros and cons	*плюс (plus),преимущество (advantages)*
Negative contexts	The size of the component parts of the object	*габариты автокресла (car seat dimensions)*
	Time and technical characteristics	*вес велосипеда (bike weight), вес смартфона (smartphone weight)* *расход воды (water consumption)* *шум при работе (noise at work)*
	Pros and cons	*минус (minus), недостаток (disadvantage)*
	небольшой/маленький(little/small)	
Positive contexts	Time and technical characteristics	*вес ноутбука (laptop weight)* *потребление электроэнергии (electricity consumption)*
	The size of the component parts of the object	*размер чайника (the size of teapot)*
Negative contexts	The size of the component parts of the object	*кнопки (buttons), морозилка(freezer)*
	Volume	*объем резервуара (tank volume), объем чаши (bowl volume)*
	Time and technical characteristics	*время работы без подзарядки (work without recharging)* *мощность (power)*
	Assortment/variety	*набор программ (set of programs)*

4.2 The category “height”: ‘высокий’ (high) – ‘низкий’ (low)

‘Высокий’ (high)

1. The most frequent context of using the adjective ‘высокий’ (high) is the intention to emphasize the intensity of the sentiment feature. It usually has a positive polarity. For example, ‘высокое качество’ (high quality) *‘+’*, ‘высокая износостойкость’ (high wear resistance) *‘+’*.
2. Also quite often the adjective ‘высокий’ (high) evaluates the level of technical characteristics. It can have both positive and negative polarities: ‘высокое разре-

шение экрана' (high screen resolution) *'+'*, 'высокая светочувствительность' (high light sensitivity) *'+'*, '*высокий уровень шума при работе'* (high noise during operation) *'-'*.

3. The next context is the price characteristic: 'высокая цена' (high price) *'-'*. It always has only negative polarity.
4. In its main meaning - long extension from bottom to top – the adjective 'высокий' (high) is used much less frequently in reviews. For example, 'высокие бортики коляски' (high sides of a stroller) *'+'*.
5. In reviews on food or nutritional supplements, animal feed, stable combinations with the adjective 'высокий' (high) are used, indicating the composition of the product. For example, 'высокое содержание белка' (high protein content) *'+'*, 'высокое содержание химикатов' (high chemical content) *'-'*.

'Низкий' (low)

The adjective 'низкий' (low) in almost all cases will have opposing contexts of use. In a positive context, it will most often denote a price, and in a negative context, it will indicate a low degree of positive tonal sign, for example, 'низкое качество сборки' (low build quality).

Both the positive contexts and the negative contexts for adjectives 'высокий' (high) – 'низкий' (low), are presented in Table 4.

Table 4. Positive and the negative contexts for adjectives 'высокий' (high) - 'низкий' (low)

Type of context	Context	Example
	высокий (high)	
Positive contexts	Intensity of the positive sentiment feature	*маневренность (maneuverability), износостойкость(wear resistance)*
	Technical characteristics	*разрешение экрана (screen resolution), производительность (performance)*
		скорость загрузки (load speed), скорость приготовления (cooking speed)
	The height	*бортики (flanges)*
	Chemical composition	*процент белка (percent of protein), содержание*
Negative contexts	Price	*цена (worth)*
	Intensity of the negative sentiment feature	*вибрация (vibration)*
	низкий (low)	
Positive contexts	Price	*цена (price)*
	Technical characteristics	*расход кофе (coffee consumption)*
	Intensity of the negative sentiment feature	*уровень шум(degree of noise)*
Negative contexts	Intensity of the positive sentiment feature	*качество(quality), надежность(reliability)*
	Technical characteristics	*скорость взбивания (whipping speed) КПД (efficiency), светочувствительность(photosensitivity)*

	The height	*поддон (pallet)*
	Chemical composition	*содержание минералов(content of minerals)*

4.3 The category “weight”: ‘тяжелый’ (heavy) – ‘легкий’ (light)

‘Тяжелый’ (heavy)

1. The most frequent for the word ‘тяжёлый’ (heavy) is weight of the object. This adjective can express a positive sentiment. For example, ‘тяжелый металлический корпус смартфона’ (heavy metal case of the smartphone) *‘+’*. In such cases, there is a “strong”, “reliable” or “steady” connotation. It also can express negative sentiment: ‘тяжелое зарядное устройство’ (heavy power bank) *‘-’*.
2. This adjective may also be used in negative contexts expressing difficulty in implementing a process or the need to put a lot of effort.

‘Легкий’ (light)

This adjective can occur in all three contexts described above as the adjective ‘тяжёлый’ (heavy).

But also, it can express the intensity of the negative sentiment feature: ‘легкий скрежет’ (light rattle) ‘-’, ’легкий запах пластика’ (light plastic smell) ‘-’, ‘легкое дребезжание’ (light chatter) ‘-’.

Both the positive contexts and the negative contexts for adjectives ‘тяжелый’ (heavy) – ‘легкий’ (light), are available in Table 5.

Table 5. Positive and the negative contexts for adjectives ‘тяжелый’ (heavy) – ‘легкий’ (light)

Type of context	Context	Example
	тяжёлый (heavy)	
Positive contexts	Weight	*металлический корпус (metal case)*
Negative contexts	Weight	*щипцы для волос(hair tongs)*
	It takes a lot of effort	*ход велосипеда(bike ride)*
	Difficulty in implementing a process	*настройка(adjustment), очистка(cleaning)*
	лёгкий (light)	
Positive contexts	Simplicity in implementing a process	*навигация по меню(menu navigation), эксплуатация(exploitation)*
	Weight	*ноутбук(laptop)*
	It takes a little of effort	*ход(baby carriage run)*
Negative contexts	Intensity of the negative sentiment feature	*скрежет(rattle), запах пластика(plastic smell)*

4.4 The category “strength”: ‘сильный’ (strong) – ‘слабый’ (weak)

‘Сильный’ (strong)

1. The first context for the word ‘сильный’ (strong) is significant in physical strength, powerful. For example, ‘сильный адаптер’ (strong adapter) *‘+’*. In this context it always expresses a positive sentiment.
2. The second context of the use of the adjective ‘сильный’ (strong) is impressive. For example, ‘*сильный дизайн’* (strong design) *‘+’*. In this context it also usually expresses a positive sentiment.
3. The adjective ‘сильный’ (strong) is used in context of the intensity of the sentiment feature. Most often this is a negative context: ‘*сильное искажение’* (strong distortion) *‘-’*, ‘*сильный нагрев’* (strong heat) *‘-’*.

‘Слабый’ (weak)

We did not reveal explicit positive contexts for the adjective ‘слабый’ (weak). In negative contexts, the adjective is most often used to describe the construction, assembly or for expression the intensity of the negative sentiment feature.

Both the positive contexts and the negative contexts for adjectives ‘сильный’ (strong) – ‘слабый’ (weak) are shown in Table 6.

Table 6. Positive and the negative contexts for adjectives ‘сильный’ (strong) – ‘слабый’ (weak)

Type of context	Context	Example
	‘сильный’ (strong)	
Positive contexts	Powerful	*ноутбук (laptop), видеокарта(graphics card)*
	Impressive:	*дизайн(design)*
Negative contexts	Intensity of the negative sentiment feature	*сильное искажение(strong distortion), сильный нагрев (strong heat)*
	‘слабый’ (weak)	
Negative contexts	Intensity of the negative sentiment feature	*скрежет(rattle), запах пластика(plastic smell)*
	Not powerful	*батарея(battery), процессор(proceccor)*
	Construction	*сборка(assembly), крепление(bracing)*

Several observations can be made on the basis of the results presented above. First, some contexts of the given adjectives can carry varying polarities: positive or negative. Other contexts have only one polarity – either positive or negative. Second, disambiguation contexts of the same words provide information about the semantics of these words. Besides, it partially solves the polarity disambiguation problem for those classes that carry only one polarity.

5 Experiment

We set the task to automatically determine the contexts the parametric adjective «big». It was chosen as the most frequently used parametric word in our corpus. We formed a dataset of 750 sentences in which the word "big" is used across the 29 domains. The dataset was divided into training and test. There were 375 sentences in each dataset. Both datasets were manually tagged with the target cluster.

We tokenized the sentences and extracted aspect terms for word «big» for each sentence using UDPipe [12]. We used aspect terms as features. Using only the aspect terms as features we employ some well-known classical classifiers: Support Vector Classification (SVC), Random Forest and KNeighbors classifier. We adopt micro and macro precision, micro and macro recall and micro and macro F1-score as the measures of evaluation. Our algorithm produced better results when used with the SVC classifier. The results are presented in the Table 7 and Table 8.

Table 7. The scores of the different classifiers

Classifier	**Micro precision**	**Micro recall**	**Micro F1**	**Macro precision**	**Macro recall**	**Macro F1**
KNeighbors	0.65	0.65	0.65	0.59	0.72	0.63
Random Forest	0.75	0.75	0.75	0.69	0.73	0.71
SVC	0.80	0.80	0.80	0.78	0.71	0.74

Table 8. Performance of SVC for clusters of context

Cluster	**precision**	**recall**	**F1**
5- The physical size	0.82	0.90	0.86
4- The physical volume	0.82	0.84	0.83
2- Assortment/variety	0.81	0.74	0.77
3- Advantages/disadvantages	0.72	0.61	0.66
1- Technical and other characteristics	0.76	0.49	0.59

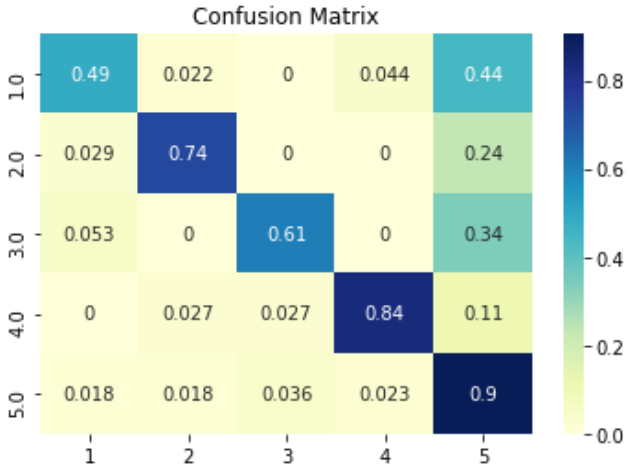

Fig. 1. A confusion matrix of SVC for clusters of context

It can be seen from Table 8 and Fig. 2 that the classifier scores for some clusters significantly outperform the scores in other clusters. This is partly due to the fact that the number of sentences per cluster is unevenly distributed in our datasets. Besides, some classes such as «Technical and other characteristics» is less consistent than the "The physical size" class. Thus, more training data and additional features are required to achieve significant improvement in such context disambiguation.

6 Conclusion

This study is the first step in the study of parametric vocabulary of customer reviews in the perspective Sentiment analysis. Parametric adjectives can reverse their polarity depending on the context, which makes it difficult to automatically determine their tonality.

In this paper, we highlighted the most common contexts for adjectives of four semantic classes such as size, height, weight, and strength. Our experiment demonstrates that it is possible to determine the context automatically using machine learning with the sufficiently high precision.

As future work, we can conduct a more detailed quantitative study of the use of parametric adjectives in different contexts and the development of rules or other methods for automatic determining their polarity depending on the context.

References

1. Achaeva, O. I.: Parametrical adjectives wide/narrow in Russian and English: the semantic aspect [Parametricheskie prilagatelnie Shirokiy/Uzkiy v russkom I angliyskom yazykah: semanticheskiy aspect]. Bulletin of the Kemerovo State University [Vestnik Kemerovskogo gos. un-ta] 2(62), 3, 120–122 (2015).
2. Apresyan, Yu. D.: Lexical semantics: synonymous means of language [Leksicheskaya semantika: sinonimicheskiye sredstva yazyka]. Nauka, Moscow (1995).
3. Brunova, E.G.: Features of parametric vocabulary in content analysis of opinions [Osobennosti parametricheskoy leksiki pri kontent analize mneniy]. In: Philological sciences. Questions of theory and practice [Philologicheskie nauki. Voprosy teorii I praktiki], 12(42), 35–39 (2014).
4. Bulgakova, M.P.: Evaluative derivites of parametric adjectives of German and French languages in comparative aspect. [Otsenochnyye derivaty parametricheskikh prilagatelnykh nemetskogo I frantsuzskogo yazykov v sopostavitelnim aspecte]. In: Materials of the annual scientific conference of teachers and graduate students of the MSLU [Materialy ezhegodnoy nauchnoy konferentsii prepodavateley i aspirantov MSLU], 118–120 (2018).
5. Efanova, L.G.: To the question of parametric norms [K voprosu o parametricheskikh normakh]. Bulletin of Tomsk University [Vestnik Tomskogo universiteta], 1(21), 22–31 (2013).
6. Liu, B.: Sentiment analysis and opinion mining. Synthesis lectures on human language technologies, 5(1), 1–167 (2012).
7. Mikheeva, S.L.: Russian parametric adjectives: Antropocentricity of semantic and causative potential [Parametricheskie prilagatelnie russkogo yazykah: antropocentrichnost and cauzativniy potencial]. Bulletin of I.Y. Yakovlev ChSPU [Vestnik ChGPU im I.Y. Yakovleva], 3(103), 135–140 (2019).
8. Pang, B., Lee, L.: Opinion Mining and Sentiment Analysis. Foundations and Trends in Information Retrieval, 2(1–2), 1–135 (2008).
9. Puzanova, Y.S.: Parametrical adjectives of Russian language: research of ontogenesis on the material of spontaneous speech data [Parametricheskie prilagatel'nye russkogo yazyka: issledovanie ontogeneza na materiale dannyh spontannoy rechi]. News of the Russian State Pedagogical University A.I. Herzen [Izvestia Rossiyskogo gosudarstvennogo pedagogicheskogo gosudarstvennogo universiteta im A.I. Gertsena], 137–141 (2012).
10. Sanyarova, R.R.: Comparative study of parametric adjectives in the paremiological picture of the world (on material English, Bashkir and Russian languages) [Sopostavitelnoye izuchenie parametricheskih prilagatelnyh v paremiologicheskoy kartine mira (na materiale angliyskogo, bashkirskogo I russkogo yazykov). Bulletin of the Bashkir University [Vestnik Bashkirskogo universiteta], 24 (3), 671–676 (2019).
11. Schramm, A. N.: Essays on the semantics of quality adjectives: on the material of modern Russian language [Ocherki po semantike kachestvennyh prilagatelnyh: na material sovremennogo russkogo yazyka]. Publishing House of Leningrad State University [Izdatelstvo LGU], Leningrad (1979).
12. Semenova, S. Ju.: On the Class of Russian Parametric Adverbs [O klasse russkikh parametricheskikh narechiy]. In: Computational Linguistics and Intellectual Technologies: Proceedings of the International Conference “Dialogue 2014”, 573–585 (2014).
13. Wu, Y, Jin, P.: Semeval-2010 task 18: disambiguating sentiment ambiguous adjectives. Language Resources and Evaluation, 47(3), 743–55 (2013).
14. Xia, Y., Cambria, E., Hussain, A., Zhao, H.: Word Polarity Disambiguation Using Bayesian Model and Opinion-Level Features. Cognitive Computation, 7(3), 369–380 (2014).

15. Xu, R, Xu, J, Kit, C.: HITSZ_CITYU: Combine collocation, context words and neighboring sentence sentiment in sentiment adjectives disambiguation. In: Proceedings of the 5th international workshop on semantic evaluation SemEval'10, 448–451. ACM, Stroudsburg, PA, USA (2010).
16. Yang, SC, Liu, MJ. YSC-DSAA: an approach to disambiguate sentiment ambiguous adjectives based on SAAOL. In: Proceedings of the 5th international workshop on semantic evaluation SemEval'10, 440–443. ACM, Stroudsburg, PA, USA (2010).